CACM is not a Valid Basis for an X-factor Input Price Index

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Key Messages

- Modern productivity analysis relies on knowledge about changes in input prices to determine TFP
- Because of this, it is economically illegitimate to use a different input price index in the X-factor calculation than used to develop the TFP value
- Use of an alternative input price index consistently in both the X-factor and TFP equations would yield no net change in the BLS KLEMS X-factor of 1.99%
- Even if their use was legitimate, the CACM-related input price change estimates proposed by Sprint do not provide a more accurate or more BDS-specific measure of actual BDS input price changes than the BLS KLEMS measure

Changes in the input price index inform both the X-factor and TFP

- TFP is the rate of growth of output quantity relative to input quantity
  - To compute TFP, economic productivity analysis relies on duality between costs and prices: *Cost = Price × Quantity*
  - Because quantities are rarely known, *Cost / Price* is typically the measure used for *Quantity*
  - This means that: *TFP growth = [Output Revenue growth – Output Price growth] – [Input Cost growth – Input Price growth]*
  - This implies that as measured input price growth declines (i.e., input quantity growth increases), measured TFP growth also declines
- The X-factor is also a direct function of input price growth
  - *X-factor = GDP-PI growth – Input price growth + TFP growth*
- The same measure for input price growth must be used in the TFP equation as in the X-factor equation or economic duality is broken. This important point was also recognized by Ad Hoc.

Any alternate input price index for the X-factor must also be used to develop TFP

- If a superior or "more BDS-specific" input price series has been developed, it also must be employed to develop a superior, "more BDS-specific" measure for TFP
  - But a smaller rate of input price growth reduces measured TFP growth to the same extent that it may directly raise X
  - Thus, the two effects cancel out in the complete X-factor equation
- Because this result is a necessary consequence of economic duality, any proper use of Sprint's proposed alternate input price growth series leaves unchanged the figure of 1.99% that we compute for X over the 2005-2014 test period
- Conversely, because Sprint's proposal ignores economic duality, it amounts simply to putting numbers together to produce a result that is without any meaningful economic content

Sprint's alternate input price index is not more appropriate than the BLS KLEMS index

- Sprint's proposed alternative input price index fails basic economic sanity checks
  - If it represents "wireline telecommunications" as Sprint claims, it implies unrealistically high rates of input price growth for wireless telecommunications and broadcasting
  - It also implies that output price growth should have been far less in the wired telecommunications sector than in the wireless, cable programming, and broadcasting sectors
  - But output price growth statistics from the BLS' Producer Price Index suggest that the reverse took place: output price growth was higher in wired telecommunications than in these other sectors

Sprint's alternate input price index is not more appropriate than the BLS KLEMS index

- CACM is not a model of BDS supply
  - Assumes a single, most-efficient, forward-looking packet technology, that is all fiber with 100% coverage to produce only best-effort mass-market BIAS versus an embedded largely copper network employing TDM technology to provide specially-designed circuits to a relatively small set of business locations with highly variable demands
  - The NPRM notes (at ¶13) that such networks have costs that are substantially less than BDS networks and fail to provide the guaranteed symmetric bandwidth that is cited frequently by Sprint as a necessary attribute of BDS – to the extent that the FNPRM concludes these networks are not competitive substitutes
  - All of this conflicts with the sole supporting statement advanced for use of CACM-related inputs, that "there are no reasons to think" that BDS input prices and costs should differ from those related to residential CACM BIAS

Sprint's alternate input price index is not more appropriate than the BLS KLEMS index

- The CACM peer review response (CPRR) input prices are incomplete, unsuitable for BDS, inaccurate, and intentionally biased downwards
  - It is our understanding that the CACM has literally thousands of individual inputs, but the CPRR posited prices for only ten large aggregates, with no discernable effort to weight internally within these aggregate categories
  - The BLS KLEMS process develops input prices divided over five basic input types: Kapital, Labor, Energy, Materials, and Services. The CACM abstracts from this actual input diversity and assumes Energy, Materials and Services (which constitute 45% of total costs) to be subsumed within its K and L categories, plus a large set of opaque loading factors
  - The CPRR openly admits that its input price estimates are not based on good data sources
  - Because the purpose of the CPRR was to reassure that the CACM wouldn't overestimate future costs, the Staff writing it deliberately (and appropriately) sought to understate their estimates for input price growth

Sprint's alternate input price index is not more appropriate than the BLS KLEMS index

- It is our understanding that several of the ten aggregate input categories are not even used for BDS, and none are likely to be used in the same proportions as these inputs are used in actual BDS networks because of large differences in design and scope of BDS networks versus the CACM mass-market FTTH BIAS network
- Although the CPRR posits a range of values for three of its ten input categories (electronics, labor, and land/buildings), it provides no range of uncertainty for its estimates for the remaining seven categories. Further, the electronics category is vast and extremely ambiguous as to its contents – and the value range estimated for its price growth is huge
- The value assigned to labor constitutes only wage growth and omits major fringe benefits like healthcare – which have grown much faster than wages over the test period
- The price growth posited for land and buildings has no specificity to land and buildings used in the production of telecommunications services of any type

Sprint's adjustments to the CACM estimates are ill-considered and incomplete

- Sprint fails to convert capital input prices into economically appropriate user/rental prices
  - Its stated "economic lives" are stale projection lives, unadjusted for cost of removal or salvage value
  - Posited depreciation fails to account for changes in the cost of finance or economic revaluation due to changes in the price for new equipment
  - Switching lives are applied to circuit equipment and land is depreciated
- Sprint's development of Opex price growth is faulty and developed to bias downwards Sprint's estimate of overall price growth
  - Assumes the Opex associated with a single-service mass-market BIAS network matches that for one consisting entirely of specially-designed BDS circuits
  - Sprint mixes national capital quantities with large urban opex quantities. This overweights lower-price-growth capital components and underweights higher-price-growth labor components comprising its overall input price index. The result is an input price growth index that is biased downwards

Other reasons for rejecting Sprint's proposed X-factor calculations

- Sprint's calculations, even if they were legitimate, project a false sense of precision that is not warranted by the accuracy of their data
  - Uncertainty ranges are absent for all inputs other than electronics, labor and land/buildings and the ranges assumed for labor and land/buildings are highly compressed
- 2005-2014 remains the best test period for a forward-going X-factor, not 1997-2014
  - Sprint is incorrect that the shorter period is corrupted by the Great Recession because the X-factor depends only on the difference between industry and national productivity
  - Sprint produces no cohesive data set that is consistent across its proposed longer period
  - The longer period cannot be chosen for X-factor development and not also used to compute any going-in price reset

Conclusion

- The Sprint proposal fails on a number of levels and does not provide an appropriate or reliable basis for establishing the BDS X-factor input price index
  - The proposed use of CACM-related values for one input price index and BLS KLEMS values for another violates economic principles
  - CACM does not reflect input prices of networks that actually provide BDS
  - CACM input price growth figures are arbitrary and biased downwards